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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/706,447	11/12/2003	Yoshikazu Takahashi	501646.20003	7993

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REED SMITH, LLP  
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NEW YORK, NY 10022-7650

EXAMINER

MRUK, GEOFFREY S

ART UNIT	PAPER NUMBER
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2853

DATE MAILED: 06/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/706,447

Applicant(s)

TAKAHASHI, YOSHIKAZU

Examiner

Geoffrey Mruk

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) 8-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>12 November 2003</u>  | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION**

***Election/Restrictions***

Claims 8-14 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 21 April 2005.

Applicant's election with traverse of Group I in the reply filed on 21 April 2005 is acknowledged. The traversal is on the ground(s) that the subject matter of the method claims and device claims are sufficiently related. This is not found persuasive because the inventions have acquired a separate status in the art as shown by their different classification.

The requirement is still deemed proper and is therefore made FINAL.

***Specification***

The disclosure is objected to because of the following informalities:

Page 2, line 23 states, "heart generation". Examiner suggests changing "heart" to heat.

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimada et al. (US 2002/0080213 A1) in view of Corwin et al. (US 3,317,762).

With respect to claim 1, the primary reference of Shimada discloses an apparatus for ejecting droplets (paragraph 0010) comprising:

- a passage unit (Fig. 1, elements 10, 20, 30, 40) formed therein with plural nozzles (Fig. 1, array of element 11) through which droplets are ejected and pressure chambers ( Fig. 1, array of element 12) each connected to a corresponding nozzle; and
- an actuator unit (paragraph 0156, i.e. piezoelectric actuator) that applies an ejection energy to liquid in the pressure chambers (paragraph 0173), in which a piezoelectric sheet (Fig. 1, element 70) is sandwiched between electrodes (Fig. 1, elements 60, 80) to thereby form plural active portions (Fig. 2b, element 320), the actuator unit being bonded to the passage unit such that each of the active portions may face the pressure chambers,
- wherein, at an operating temperature, the actuator unit receives stress (paragraphs 0167-0169) in a direction substantially parallel to a face (Fig. 6a, elements  $\sigma_1$ -  $\sigma_4$ ) thereof bonded to the passage unit.

With respect to claim 2, the primary reference of Shimada discloses the bonded face of the actuator unit (paragraph 0156, i.e. piezoelectric actuator) to the passage unit (Fig. 1, elements 10, 20, 30, 40) has a rectangular shape (Fig. 2a, elements 10, 20, 30, 40), and wherein the stress acts in a direction along a longitudinal direction (Fig. 6a, elements  $\sigma_1$ -  $\sigma_4$ ) of the actuator unit (paragraphs 0167-0169).

With respect to claim 3, the primary reference of Shimada discloses

- the passage unit (Fig. 2b, elements 10, 20, 30, 40) has a first plate (Fig. 2b, element 50) formed therein with the pressure chambers (Fig. 2b, element 12),
- a second plate (Fig. 2b, elements 10, 21) formed therein with a liquid containing chamber that contains liquid provided to the pressure chambers (Fig. 2b, element 12), and
- a third plate (Fig. 2b, element 20) formed therein with the nozzles (Fig. , and wherein the actuator unit (paragraph 0156, i.e. piezoelectric actuator) is bonded on the first plate.

With respect to claim 4, the primary reference of Shimada discloses in the passage unit (Fig. 1, elements 10, 20, 30, 40), wherein the second plate (Fig. 2b, elements 10, 21) is sandwiched between the first plate (Fig. 2b, element 50) and the third plate (Fig. 2b, element 20), and wherein each of the pressure chambers (Fig. 2b, element 12) communicates with a corresponding nozzle (Fig. 2b, element 11) at one end thereof and with the liquid containing chamber (Fig. 2b, element 31) at the other end thereof (Paragraph 0173).

However, Shimada fails to disclose the actuator unit receives stress of -40 MPa to 10 MPa.

The secondary reference of Corwin discloses a pre-stressed spherical electro-acoustic transducer wherein "the spherical transducer is further provided with an outer electrode specifically having internal tensile stress which places the ceramic material under a predetermined degree of initial compression" (Column 2, lines 46-55; Fig. 5, element C).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the pre-stressed condition (Fig. 5, element C) of Corwin in the inkjet recording head of Shimada. The motivation for doing so would have been "enabling application of much greater excitation and development of much greater acoustic intensity without rupture of the transducer" (Column 2, lines 46-55).

2. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimada et al. (US 2002/0080213 A1) in view of Corwin et al. (US 3,317,762) as applied to claims 1-4 above, and further in view of Akahane (US 6,142,616).

Shimada and Corwin references disclose all of the limitations of the apparatus for ejecting droplets except

- a difference in linear expansion coefficient between the passage unit and the actuator unit is more than -7 parts per million (ppm) and below 24 parts per million(ppm).
- the passage unit and the actuator unit are bonded to each other with a thermosetting adhesive that has a curing temperature of 30°C to 200°C, and

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- the thermosetting adhesive is an epoxy-based material.

Akahane discloses a linear expansion coefficient of the passage unit is  $3 \times 10^{-6}/^{\circ}\text{C}$  (Column 7, lines 5-12), the lower electrode (element 60) is made of platinum (Column 5, lines 40-42), where for the examination process, the linear expansion coefficient of the platinum is  $5 \times 10^{-6}/^{\circ}\text{C}$  (Marks' Standard Handbook for Mechanical Engineers, page 6-11, Table 6.1.9), the passage unit and the actuator unit are bonded to each other with a thermosetting adhesive that has a curing temperature of  $30^{\circ}\text{C}$  to  $200^{\circ}\text{C}$  (Column 7, lines 5-18, i.e.  $80^{\circ}\text{C}$ ), and the thermosetting adhesive is an epoxy-based material (Column 7, line 12).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the linear expansion coefficients and the bonding process of Akahane in the inkjet recording head of Shimada. The motivation for doing so would have been "the coefficient of linear expansion of the sealing plate is an allowable range in an ink droplet jetting characteristic according to experiments by the inventors" and "the time of a bonding process is also reduced" (Column 7, lines 5-18).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is (571) 272-2810. The examiner can normally be reached on 7am - 330pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GSM  
5/23/2005

GM

  
MANISH S. SHAH  
PRIMARY EXAMINER

5/27/05